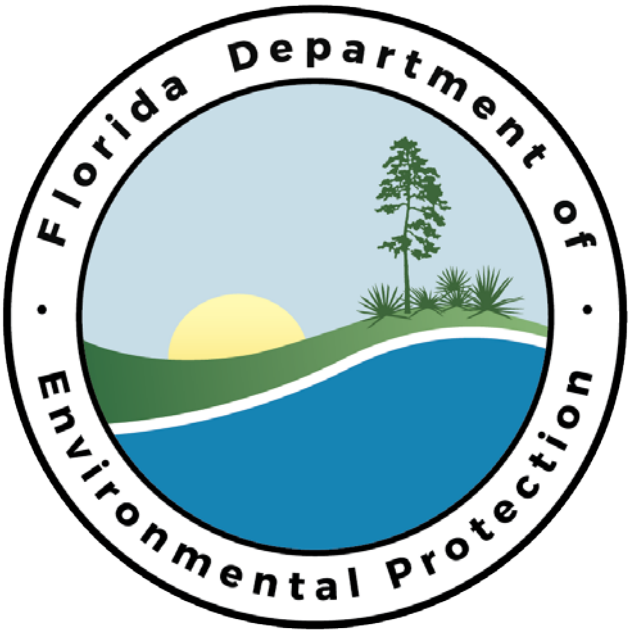

Quick Guide to QA Requirements for Volunteer Sampling Programs

DEP-AEQA-001/17

Aquatic Ecology and Quality Assurance Section

June 2017

Purpose

Florida has numerous volunteer monitoring programs, and the data produced by those programs are potentially valuable to the Florida Department of Environmental Protection (DEP) to assess the water quality and overall health of the State's surface waterbodies, particularly given DEP's limited monitoring resources. The DEP must ensure that any data used for water quality assessment decisions are scientifically and legally defensible. Chapter 62-303, Florida Administrative Code (F.A.C.), the Impaired Waters Rule, requires that data used for water quality assessments be collected following Chapter 62-160, F.A.C., the DEP Quality Assurance (QA) Rule. The QA Rule generally requires that sampling is conducted per DEP standard operating procedures (SOPs) and analyses are performed by certified environmental laboratories. Volunteer monitoring programs are sometimes not familiar with DEP QA requirements, or deviate from those requirements due to logistical constraints. The purpose of this document is to outline the minimum DEP data quality requirements for a volunteer monitoring program to ensure that the data they collect can be used to assess the health of the monitored waters. Organizations that meet these requirements provide DEP with increased assurance that data generated by the organizations meet data quality objectives for waterbody assessments.

Quality System

All volunteer monitoring programs must have an organized and maintained Quality System, which includes:

- Training of volunteer samplers and coordinators
- Volunteer sampler field proficiency demonstrations (sample collection and field testing)
- Documentation of the process for volunteer training and proficiency checks
- Documentation of procedures for sample collection, preservation, storage, and transmittal; data evaluation; and data management
- Documentation of all required information necessary to verify sample results for each sampling event and sampling site/station/location (see FD 1000)
- Field testing instrument verifications (not just calibration of instruments)
- Quality control samples, if applicable (*e.g.*, field-QC blanks for nutrients); see FQ 1000 and page 12 below
- Sufficient record-keeping to show that DEP SOPs and organization-specific procedures were followed
- Use of appropriate sampling procedures to ensure representativeness, for example:
    - Collect water samples before measuring Secchi and total depth to avoid stirring up the sediment
    - Measure dissolved oxygen (DO) and temperature directly in the waterbody, not from a bucket or bottle

- Develop awareness of and follow procedures for controlling sources of artificial contamination of samples, sample containers, reusable sampling equipment, sample preservatives, and calibration standards

Field Testing

- Sample Measurements – Field testing for dissolved oxygen (DO), pH, specific conductance or salinity, and temperature, must follow applicable DEP field testing SOPs, FT 1000 – FT 1500, as explained on pages 5-8.
- Non-DEP SOP Methods - For DEP assessments to include any data collected by other methods (*e.g.*, test kits), the monitoring program must obtain approval from the DEP Aquatic Ecology and QA Section (AEQAS) for use of an alternative field method, per Rule 62-160.220, F.A.C. AEQAS will conduct a review of the alternative sampling procedures and documentation to ensure they are adequate to reconstruct data generation. Comparison studies with DEP SOP methods may be necessary.
- Calibration and Verification - For field meter use, it is not sufficient to only calibrate the instrument before use. Calibrations must be verified before and after sample collection, with standards that create a chronological and quantitative bracket for the sample measurements, when applicable (see FT 1000).

Bottle Samples

- Sample Collection Procedures - Collection of water samples for lab analyses, such as nutrients, color, or chlorophyll *a*, must follow DEP field sampling SOPs FS 1000, FS 2000, and FS 2100, as summarized on pages 9-10.
- Approved Methods and Certified Laboratories - The lab conducting the analyses must follow DEP-approved methods and be certified by the Florida Department of Health (Environmental Laboratory Certification).
    - For DEP waterbody assessments to include any data produced by other methods or analyzed by a non-certified lab, the volunteer program must obtain approval from AEQAS in accordance with Rule 62-160.330, F.A.C.
- Sample Preservation and Holding Times - Bottle samples must be preserved and held for analyses per requirements in Table FS 1000-4 (DEP SOP FS 1000) and per precautions discussed in DEP SOP FS 2000 (Part FS 2000); See pages 9-10.
    - For total nitrogen (total Kjeldahl nitrogen + nitrate+nitrite) and total phosphorus, samples must be acid-preserved in the field (for filtered or non-filtered samples), and the sample must be checked for preservation with pH paper.
        - Program coordinators can pre-acidify sample bottles for the volunteers if they are concerned about volunteers handling acid. DEP recommends use of intermediate devices to collect samples in pre-acidified bottles.
    - For analysis of chlorophyll *a*, samples must be chilled upon collection, and a documented volume of water must be filtered, extracted and analyzed within 48

hours of sample collection; or, filters must be frozen within 48 hours of collection and filtration, and frozen filters must be extracted and analyzed within 28 days.
    - Contact AEQAS to discuss any concerns or to obtain approval for alternative procedures for preservation or holding times other than those listed in the FS 1000 tables. These applications and approvals must meet requirements per Rules 62-160.220 and 62-160.330, F.A.C.
- Collection of Blanks – Field or Equipment blanks must be collected at a rate of 5% of samples per DEP SOP FQ 1000, Part FQ 1200 (see page 11 below). Blanks are not required for all analytes. For example, blanks are required for nutrient and metal samples, but not for chlorophyll *a* or bacteria samples (see FQ 1200).

Contact Information

Florida Department of Environmental Protection
Aquatic Ecology and Quality Assurance Section (AEQAS)
Nia Wellendorf, AEQAS Administrator, nijole.wellendorf@dep.state.fl.us, (850) 245-8190
Michael Blizzard, DEP QA Coordinator, michael.blizzard@dep.state.fl.us, (850) 245-8073

Quick Guide to FDEP Surface Water Sampling and Testing SOPs

This document is not a replacement for the DEP Standard Operating Procedures (SOPs), incorporated into Chapter 62-160, Florida Administrative Code. Content from the following SOPs is included in this document. All FDEP SOPs can be found at *http://www.dep.state.fl.us/water/sas/sop/sops.htm*.

FD 1000	Documentation
FQ 1000	Quality Control
FS 1000	General Sampling
FS 2000	General Water Sampling
FS 2100	Surface Water Sampling
FS 2300	Drinking Water Sampling
FS 2400	Wastewater Sampling
FT 1000	Field Testing General
FT 1100	Field pH
FT 1200	Field Specific Conductance
FT 1300	Field Salinity
FT 1400	Field Temperature
FT 1500	Field Dissolved Oxygen
FT 1900	Field Continuous Monitoring

DEP SOP FT 1100
Field Measurement of pH

Note: *Follow the manufacturer's calibration instructions specific to your meter. Use at least two standards of different concentrations to calibrate. Calibration can be conducted the day before or the morning of sampling.*

1. Calibrate!

Calibrate the pH probe.

a. Rinse the probe with analyte-free water.
b. *Gently* shake off excess water.
c. Insert probe into standard solution.
d. Set instrument to recognize the solution's concentration.
e. Rinse the probe with analyte-free water and shake off excess water.
f. Insert probe in second standard solution.
g. Set instrument to recognize that solution's concentration.
h. Finalize.

Tips:
Start with pH 7 buffer for best results.

Allow temperature to STABILIZE!

When measuring the waterbody, DO NOT disturb sediments!

2. Verify!

Perform an Initial Calibration Verification (ICV) immediately following calibration.

a. Rinse the probe with analyte-free water and gently shake off excess water and insert probe into standard solution, or use the last standard of the calibration routine for the ICV.
b. Measure a standard in *Run mode* (**not** Calibration mode).
c. Record the reading.
d. Determine if reading passes or fails per acceptance criteria, and record result. If sample fails, try verifying again, recalibrating or troubleshoot instrument. If instrument continues to not verify, remove from service.
e. Rinse the probe with analyte-free water and turn off.
f. Add a few drops of tap water into the cap to keep the probe moist while not in use, and place back on probe end.

Acceptance criteria:
pH = ±0.2

Example: If standard value is 4.0, then the ICV or CCV reading must be between 3.8 and 4.2 to pass.

Remember to Record:

- Calibration and verifications
  - Date & time
  - Pass or failure
  - Staff name/initials
- Standards
  - Concentration
  - Lot numbers
  - Expiration dates
- Sample measurement
  - Date and Time
  - Staff name/initials
  - Site location/ID
- Instrument maintenance

3. Measure!

Measure the waterbody the same way you measure the standard.

a. Turn on the probe.
b. Place probe at the depth of the desired reading.
c. Allow probe to stabilize. Record the reading.
d. Turn off.

4. Verify!

After sampling event, perform a Continuing Calibration Verification (CCV):

a. Rinse the probe in analyte-free water and gently shake off water.
b. Measure a standard in *Run mode.* The standards used for the calibration and the verifications must consist of standards both ***higher and lower*** than the measured concentration of environmental samples and verifications must occur ***before and after*** the measurement event.
c. Record the reading. Indicate pass or fail per acceptance criteria.
d. Rinse the probe with analyte-free water, store with tap water, and turn off.
e. Compare reading to acceptance criteria.
   i. If instrument fails, try CCV again.
   ii. If instrument fails a second time, qualify results with "J" and provide explanatory comment.

DEP SOP FT 1200
Field Measurement of Specific Conductance

Note: *Calibration can be conducted the night before or the morning of sampling. Calibrate in accordance with the manual that accompanies your organization's meter.*

1. Calibrate!

Calibrate the conductivity probe.

a. Rinse the probe with analyte-free water.
b. *Gently* shake off excess water.
c. Insert probe into standard solution.
d. Set instrument to solution concentration.
e. Rinse the probe with analyte-free water and shake of excess water.

2. Verify!

Perform Initial Calibration Verification (ICV) immediately following calibration.

a. Rinse the probe with analyte-free water and g*ently* shake off excess water.
b. Insert probe into a different standard solution.
c. Compare reading to acceptance criteria. ***If*** *instrument fails,* recalibrate and troubleshoot.
d. Record reading and pass or fail of acceptance criteria.

3. Measure!

Measure the waterbody the same way you measure the standard for the ICV.

a. Turn on the probe.
b. Place probe at the depth of the desired reading.
c. Allow probe to stabilize.
d. Record the reading and turn off.

4. Verify!

After the sampling event, perform a continuing calibration verification (CCV).

a. Rinse the probe with analyte-free water and *gently* shake off excess.
b. Insert probe into standard solution. The standards used for the calibration, ICV, and CCV must create a quantitative bracket around the environmental samples. A "zero" solution cannot be used as the lower limit of the quantitative bracket. The 100 µmhos/cm standard is sufficient for bracketing of sample measurements less than 100 µmhos/cm.
c. Compare reading to acceptance criteria.
    i. If instrument fails, try CCV again.
    ii. If instrument fails a second time, note on data sheets, qualify results with "J" and provide explanatory comment.

Tips:

Calibrate and verify specific conductance before pH for best results.

Allow Temperature to stabilize before calibrating or measuring. Specific conductance is temperature dependent.

Do NOT disturb sediments while measuring water body.

Acceptance criteria:
Specific Conductance = ±5%

Example: If standard value is 101 µmhos/cm, then the ICV or the CCV reading must be between 96-106 µmhos/cm to pass.

Remember to Record:

- Calibration and verifications
    - Date & time
    - Pass or failure
    - Staff name/initials
- Standards
    - Concentration
    - Lot numbers
    - Expiration dates
- Sample measurement
    - Date and time
    - Staff name/initials
    - Site location/ID
- Instrument maintenance

DEP SOP FT 1500
Field Measurement of Dissolved Oxygen (DO)

Note: *Calibration can be conducted the night before or the morning of sampling. Calibrate in accordance with the manual that accompanies your organization's meter.*

Tip:
Carefully wipe any droplets off the sensor to get the best calibrations and readings.

1. Calibrate!

Calibrate the meter at 100% DO saturation.

a. Turn meter on and allow a warm up period (10-15 minutes).
b. Wet the inside of the calibration chamber with water, pour out the excess water (leave a few drops), for calibration in 100% humid air.
c. Insert the sensor into the chamber, and wait for the temperature to stabilize.
d. Set instrument to 100% DO.

Acceptance criteria:
DO = ±0.3mg/L

Example: If the Table says the DO should be 8.37 mg/L (round to 8.4), then the ICV or the CCV reading must be between 8.1-8.7 mg/L to pass.

2. Verify!

Conduct Initial Calibration Verification (ICV) immediately following calibration.

a. Do not open the chamber. Set the instrument to *Run Mode* (some instruments automatically go to *Run Mode* after calibration).
b. Measure the temperature in the chamber and observe the readings until the instrument stabilizes.
c. Use the oxygen solubility table to determine the expected DO concentration (mg/L) at 100% saturation at the measured temperature. Record temperature and expected DO concentration.
d. Record DO probe reading and pass or fail of acceptance criteria.

Remember to Record:

- Calibration and verifications
  - Date & time
  - Table References
  - Pass or failure
  - Staff name/initials
- Sample measurement
  - Date and Time
  - Staff name/initials
  - Site location/ID
- Instrument maintenance

3. Measure!

Measure DO at sample site.

a. Turn on the probe and allow it to warm up and equilibrate.
b. Place the DO probe in the body of water you are sampling.
c. Record the reading once the temperature and DO have stabilized.
d. Keep the probe in a moist atmosphere between sites and events.

4. Verify!

Conduct a Continuing Calibration Verification (CCV) after the sampling event.

a. Wet the inside of the calibration chamber with water, pour out the excess water (leave a few drops) and insert the sensor into the chamber, for verification in 100% humid air.
b. Allow time for the DO sensor and the air inside the chamber to equilibrate.
c. Wait until temperature in the chamber stabilizes and observe/record the readings.
d. Use the oxygen solubility table to determine the expected DO concentration (mg/L) at 100% saturation at the measured temperature. Record the temperature and DO concentration on the data sheet.
e. Compare observed and expected DO concentrations. Indicate whether readings pass or fail the acceptance criteria.
   i. If instrument fails, try CCV again.
   ii. If instrument fails a second time, note on data sheets, qualify results with "J" and provide explanatory comment.

TEMP	D.O.	TEMP	D.O.	TEMP	D.O.	TEMP	D.O.
deg C	100 %	deg C	100 %	deg C	100 %	deg C	100 %
15.0	10.084	19.0	9.276	23.0	8.578	27.0	7.968
15.1	10.062	19.1	9.258	23.1	8.562	27.1	7.954
15.2	10.040	19.2	9.239	23.2	8.546	27.2	7.940
15.3	10.019	19.3	9.220	23.3	8.530	27.3	7.926
15.4	9.997	19.4	9.202	23.4	8.514	27.4	7.912
15.5	9.976	19.5	9.184	23.5	8.498	27.5	7.898
15.6	9.955	19.6	9.165	23.6	8.482	27.6	7.884
15.7	9.934	19.7	9.147	23.7	8.466	27.7	7.870
15.8	9.912	19.8	9.129	23.8	8.450	27.8	7.856
15.9	9.891	19.9	9.111	23.9	8.434	27.9	7.842
16.0	9.870	20.0	9.092	24.0	8.418	28.0	7.828
16.1	9.849	20.1	9.074	24.1	8.403	28.1	7.814
16.2	9.829	20.2	9.056	24.2	8.387	28.2	7.800
16.3	9.808	20.3	9.039	24.3	8.371	28.3	7.786
16.4	9.787	20.4	9.021	24.4	8.356	28.4	7.773
16.5	9.767	20.5	9.003	24.5	8.340	28.5	7.759
16.6	9.746	20.6	8.985	24.6	8.325	28.6	7.745
16.7	9.726	20.7	8.968	24.7	8.309	28.7	7.732
16.8	9.705	20.8	8.950	24.8	8.294	28.8	7.718
16.9	9.685	20.9	8.932	24.9	8.279	28.9	7.705
17.0	9.665	21.0	8.915	25.0	8.263	29.0	7.691
17.1	9.645	21.1	8.898	25.1	8.248	29.1	7.678
17.2	9.625	21.2	8.880	25.2	8.233	29.2	7.664
17.3	9.605	21.3	8.863	25.3	8.218	29.3	7.651
17.4	9.585	21.4	8.846	25.4	8.203	29.4	7.638
17.5	9.565	21.5	8.829	25.5	8.188	29.5	7.625
17.6	9.545	21.6	8.812	25.6	8.173	29.6	7.611
17.7	9.526	21.7	8.794	25.7	8.158	29.7	7.598
17.8	9.506	21.8	8.777	25.8	8.143	29.8	7.585
17.9	9.486	21.9	8.761	25.9	8.128	29.9	7.572
18.0	9.467	22.0	8.744	26.0	8.114	30.0	7.559
18.1	9.448	22.1	8.727	26.1	8.099	30.1	7.546
18.2	9.428	22.2	8.710	26.2	8.084	30.2	7.533
18.3	9.409	22.3	8.693	26.3	8.070	30.3	7.520
18.4	9.390	22.4	8.677	26.4	8.055	30.4	7.507
18.5	9.371	22.5	8.660	26.5	8.040	30.5	7.494
18.6	9.352	22.6	8.644	26.6	8.026	30.6	7.481
18.7	9.333	22.7	8.627	26.7	8.012	30.7	7.468
18.8	9.314	22.8	8.611	26.8	7.997	30.8	7.456
18.9	9.295	22.9	8.595	26.9	7.983	30.9	7.443

DEP SOP FS 2100
Surface Water: Direct Grab Sampling

Situations to Consider When Sampling Waterbodies

> ***Remember to Record on label AND Field sheets:***
> - Collection date and time
> - Unique site ID
> - Analyte of interest
> - Indication if duplicate or blank
> - Sampler names
> - Type of preservative used

- Collect surface water samples from downstream towards upstream.
- When using watercraft, take samples near the bow, away and upwind from any gasoline outboard engine. Orient the watercraft so that bow is positioned in the upstream direction.
- When wading, collect samples upstream from your body.
- Avoid skimming the surface.
- Take extreme caution not to disturb *sediments* around the area where the sample is collected.
- Consider the *representativeness* of selected sampling locations. Know why the sample is being collected, and whether the sampling location will provide a representative measure of the condition of the waterbody at the time the sample is taken.
- When sampling in shallow water:
  - Do not collect a grab sample from water less than 10 cm deep.
  - Especially for waters with low or no flow, use extreme caution to not disturb the sediment.
  - Use of an intermediate vessel or device such as a dipper or pump may be best for avoiding sediment disruption or when sample bottles are pre-acidified.

To Collect a Direct Grab Sample:

1. Remove the container cap, turn the bottle upside down, and slowly submerge the container, opening first, into the water to the desired sample depth. Do not touch or allow anything to contact the inside of the cap or sample container other than the sample itself.
2. Turn the bottle so the opening is upright and pointing towards the direction of water flow. Allow water to run slowly into the container until it is full.
3. Return the filled container quickly to the surface.
4. Pour out some of the sample to leave a little space in the bottle for addition of preservatives and sample expansion, if needed.
5. Follow the instructions below for adding an acid preservative, if required for the analysis (*e.g.*, nutrients, metals). ***If the sample bottles are pre-acidified, see p.10 of this manual.***
   a. Add the prescribed amount of acid to the samples without letting the pipet or vial touch the sample bottle (contamination prevention).
   b. After screwing on the cap, mix the acid and the sample by gently inverting the bottle a few times.
   c. Test the sample's pH to ensure it is in the appropriate range (≤ 2) by pouring a small amount of sample onto pH paper. Do not dip the pH paper into the sample bottle.
   d. If pH is in the required range, close the bottle and prepare for shipping. If pH is too high, add more acid one drop at a time until the required pH is reached. Document how much acid is added to the sample.
6. Put sample bottles ***in ice*** within 15 minutes of collection.

DEP SOP FS 2100
Surface Water: Intermediate Device Sampling

To Collect a Sample with an Intermediate Device:

1. Rinse the sampling device three times with site water before collecting a sample.
2. Discard rinsate away from **and** downstream of the sampling location.
3. Fill sampling device with enough sample water.
4. Begin pouring or allow flow from device and then place bottle under the flow taking care not to touch the device to the bottles.
5. Fill sample bottles with intermediate device.
6. Remove bottle from flow from the sampling device and cap, leaving adequate headspace.

To Collect a Sample at a Specific Depth:

1. Measure the depth of the water column to determine total site depth and sampling depth before lowering the sampling device.
2. If you touch the bottom to determine the total site depth, make sure you do not then collect samples in the sediment plume.
3. Lower the sampler slowly to the designated sampling depth. Mark the line attached to the sampler with depth increments so that the sampling depth can be accurately recorded. **Do not** disturb sediments.
4. If you are using a Van Dorn/Alpha/Niskin bottle, send the messenger weight to trip the closure mechanism at the desired depth.
5. Retrieve the sampler slowly.
6. Conduct steps 3 through 5 three times to rinse the sampler with site water before collecting a sample.
7. Discard rinsate away from and downstream of the sampling location. The sampler design may allow rinsing of the sampler underwater with the sampler caps held open.
8. Lower and retrieve the sampling device after rinsing to collect the bulk sample for distribution into sample containers.
9. Fill the individual sample bottles via the sampler discharge tube or spigot.
10. Follow the instructions below for adding an acid preservative if required for the analysis (e.g., nutrients, metals) and bottles are not pre-acidified.
    a. Add the prescribed amount of acid to the samples without letting the pipet or vial touch the sample bottle (contamination prevention)
    b. After screwing on the cap, mix the acid and the sample by gently inverting the bottle a few times.
    c. Test the sample's pH to ensure it is in the appropriate range (≤ 2) by pouring a small amount of sample on the pH paper. Do not dip the pH paper into the sample bottle.
    d. If pH is in the required range, close the bottle and prepare for shipping. If pH is too high, add more acid one drop at a time until the required pH is reached. Record how much acid is added to the sample.

Record on Field sheets or Equipment Logs:

- Indication that equipment was used to collect sample
- Equipment unique ID
- Equipment maintenance
- Initials of person who performed maintenance
- Date and time of maintenance
- Document cleaning procedures of equipment, along with date and persons' responsible
- Note the cleaning reagents name and lot numbers

DEP SOP FQ 1210
Collecting Quality Control Blanks by Type

Blanks Monitor….

- Sampling environment
- Sampling equipment decontamination
- Sample container cleaning
- Suitability of sample preservatives
- Analyte-free water
- Sample transport
- Storage conditions

Tips:
Treat blanks the same as samples. They should be collected, preserved, and transported the same way as the samples.

Pre-cleaned equipment blanks

1. **PLAN:** Use sampling equipment that has been brought to the site pre-cleaned and ready for use. Cleaning procedures MUST BE IDENTICAL to those used for the field sample collection. Collect these blanks before the equipment has been used.
2. **COLLECT & PRESERVE:** Rinse the pre-cleaned sampling equipment with DI water. After rinsing, collect analyte free water into the sample bottle using the equipment. Preserve as described at the bottom of the page.

Records for Quality Control Samples

- Analyte-free water
  - Provider
  - Where and when produced
  - Lot number
- Analyte of interest
- Indication if duplicate or blank
- Preservation information
- Equipment used

Field-cleaned equipment blanks

1. **PLAN:** Use sampling equipment that is cleaned in the field. Cleaning procedures used for the blank collection must be identical to those used for the field sample collection.
2. **COLLECT & PRESERVE:** Conduct field cleaning routine on sampling equipment. If typical routine is to rinse three times with site water, then clean equipment by rinsing three times with analyte-free water. Then use the sampling equipment to collect analyte-free water in sample containers. Collect these samples in the field before leaving the sampling site. Preserve as described at the bottom of the page.

Field Blanks

1. **PLAN:** Collect field blanks if no equipment is used to collect environmental samples.
2. **COLLECT:** Pour analyte-free water directly into sample containers.
3. **PRESERVE:** Follow the instructions below for adding an acid preservative if required for the analysis (e.g., nutrients, metals). If the sample bottle is pre-acidified, skip step (a).
   a. Add the prescribed amount of acid to the samples without letting the pipet or vial touch the sample bottle (contamination prevention).
   b. After screwing on the cap, mix the acid and the sample by gently inverting the bottle a few times.
   c. Test the sample's pH to ensure it is in the appropriate range (≤ 2.0 SU) by pouring a small amount of sample on the paper. Do not dip the pH paper into the sample bottle.
   d. If pH is in the required range, close the bottle and prepare for shipping. If pH is too high, add more acid one drop at a time until the required pH is reached. Make note of how much acid is added to the sample.

***NOTE**: If equipment is used to collect samples, equipment blanks must be collected! Field blanks are not required if equipment blanks are collected.*